APPARATUS FOR DISPOSAL OF EXCREMENTS OF BIRDS AND BEASTS AND SEA FOOD WASTES

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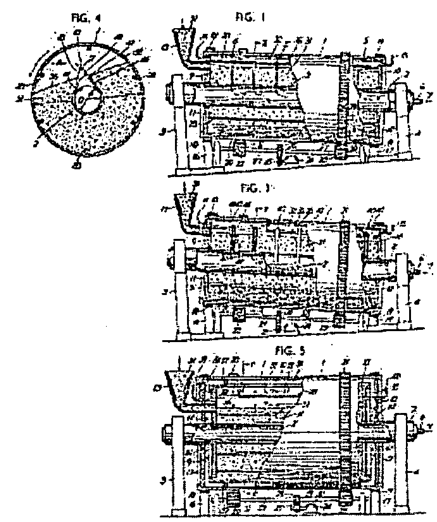
Abstract of **GB 1317061 (A)**

1317061 Sewage disposal apparatus YAMATO SETUBI CONSTRUCTION CO Ltd 5 June 1970 [30 June 1969] 27299/70 Heading C1B An apparatus for the disposal of excrements from animals and birds and sea food wastes and the production therefrom of organic manure comprises an air pipe 2 of specified diameter surrounded by a rotatable cylinder 1 and air discharge means in the form of pipes 5 are fitted to the pipe 2 and project radially therefrom. Air is passed into the cylinder 1 through holes 8 at the top ends of the pipes 5 and discs 9 and 10 respectively are coaxially fitted at each end of the pipe 2 and are loosely housed in the rotary cylinder 1 so as to close the end openings 11 and 12 respectively. The disc 9 carries a hopper 13 for supplying organic materials to the interior of the cylinder 1 and an exhaust pipe 14 for discharge of air and waste gas. The disc 10 has an exhaust pipe 15.; If the air pipe 2 has a a diameter d and the cylinder 1 has a diameter D, then in order to ensure that semi-fluid matter 31 does not form a hard core in the centre of the apparatus, the relationship between the diameters should be expressed by the equation d=D- (2A)/(D) where A is the cross-sectional area of the clearance 32 in the cylinder 1. In practice, the larger the air pipe diameter d, the less is the supply rate of the waste to be treated. Therefore it is preferable to modify the equation as follows: d=(2)/(3)(D - (2A)/(D)). The air discharge pipes 5 may be replaced by flat air discharge elements 40, each of which has a triangular body with a passage 42 and sides 45 and 46. The sides 45 and 46 are connected at the top and extend tangentially with regard to the periphery of the air pipe 2. A slit 41 in the wall of the air pipe 2 opens into the passage 42.; Each element 40 is provided with one or two air jet holes 43, 44 near the top. Since the sides 45, 46 are narrow, the sticky waste material cannot accumulate on the elements 40, so agitation of the waste is maintained. The cylinder 1 may rotate about the axis of the air pipe 2 and discs 52 and 53, which are somewhat smaller than the discs 9 and 10 may be fastened to the air pipe 2 inside and near the discs 9 and 10. The discs 52 and 53 are loosely encased in an inner cylinder 50 having a multiplicity of air holes 51, so that the openings 11 and 12 at the ends of the cylinder 1 are closed by the discs 9 and 10, while both end openings 54 and 55 in the inner cylinder 50 are closed by discs 52, 53. A hollow space 56 is provided between the cylinder 1 and the inner cylinder 50 and cylinders 1 and 50 are connected together by means of support members 57.; The air pipe 2 is provided with air jet holes 61 and 62. The disc 52 is connected with a hopper 13 opening into the inner cylinder and with an exhaust pipe 59.



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1317061

(54) AN APPARATUS FOR DISPOSAL OF EXCREMENTS OF BIRDS AND BEASTS AND SEA FOOD WASTES

(71) We, YAMATO SETUBI CONSTRUCTION COMPANY LIMITED, a Japanese corporation, of 118, Furuichi-machi, Maebashi-shi, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an apparatus capable of treating damp and small air-permeable organic wastes such as excreta (substantially faeces with a little urine) of birds and beasts, especially domestic fowls, cattle, pigs and the like, and wastes from fishery products and, further, human faeces, if necessary.

A large number of researches have so far been conducted concerning the treatment of excrements of fowls, cattle, pigs and other domestic animals and sea food wastes, which are discharged in large quantities and difficult to treat, giving rise to public hazards including odour nuisance, and concerning the utilization of the treated organic wastes as manure required in cultivation and gardening. However, such requirements as the beautification of residential quarters and natural circumstances, sanitary mass-disposal, and desirable manure production have never been fully satisfied by any conventional treatment apparatus. The reasons for this are that excreta and fish wastes are too viscous and poor in air permeability to undergo adequate treatment. Components of such organic waste matter hasten the corrosion of the apparatus. The wastes which have undergone treatment contain fertilizing constituents in small quantities and therefore in many cases are not suitable for use as manure. Moreover, the treated wastes contain moisture, which causes inconvenience to the handling thereof.

In order to overcome these disadvantages, incinerators have hitherto been employed to dry such organic wastes. The odour nuisance however is intolerable and the incinerator corrosion by oxidation is exceedingly large. In addition, the fuel cost for drying by incinerator is high, and the products of the drying disposal are poor in fertilizing components. Thus, the treatment of animal excrements and the like has been troublesome.

The present invention contemplates improving the prior treatment method thoroughly to effect convenient disposal of excretions and sea food wastes, satisfactory stench removal, and producing of quick-acting organic manure.

Using a method of treating excrements and similar organic waste materials by fermentation, this invention provides an apparatus for disposal of organic materials such as excrements of birds and beasts and sea food wastes, comprising an output cylinder, a fixed air supply pipe in the cylinder having a predetermined specified diameter to prevent rotating semi-fluid material from hardening in the form of a core in the centre of the cylinder, air discharge means fitted to the air supply pipe and projecting radially thereof, a disc provided near each end of the air supply pipe perpendicularly to the axis of the air supply pipe, the said cylinder being rotatable about the axis of the air supply pipe and housing the discs, a hopper for supplying the organic materials to the interior of the cylinder, and exhaust pipes fitted to the discs, air being fed into the air supply pipe and the cylinder and discharged through the exhaust pipes.

The phenomenon of waste deposition of the periphery of the air pipe is to some extent influenced by the viscosity of the waste under treatment and the possible existence of obstacles to air supply. It has however been ascertained through the study and experiment of the present inventors that the deposition is related mainly to the size of the air pipe, the positions of air discharge elements and the clearance for air supply in the cylinder, or the volume of the waste matter under treatment. If the diameter of the air pipe in the cylinder is excessively small as compared with that of the cylinder, the waste material in the vicinity of the inner wall of the cylinder rotates together with the rotating

cylindrical structure thus being stirred and coming into contact with air, while the waste in the centre of the cylinder is far slower in rotation than the cylinder because of the viscosity and eventually, without being stirred and much exposed to air, adheres in layers to the circumferential surface of the air pipe, and thickness of the deposit increases gradually until the deposit gets near the inner wall of the cylinder, this markedly deteriorating the agitating and airing function. On the other hand, an air pipe having an excessively large diameter lessens the treating capacity and brings about insufficient agitation and contact with air.

In view of this fact, the apparatus embodying the present invention controls the air pipe in diameter according to the cylinder diameter so as to prevent the material under treatment from solidifying like a core in the centre of the apparatus, thereby facilitating the treating operation.

One constructional embodiment of the apparatus comprises a fixed cylindrical air pipe having a predetermined specified diameter and a cylinder rotatable like a rotary kiln around the longitudinal axis of the air pipe. Organic materials are fed into the cylinder and subjected to fermentation. The diameter of the air pipe is designed to have a predetermined specified value falling within a range capable of preventing excreta and sea food wastes fed into the cylinder from adhering and hardening like a thick claylike core centred in the tank. The organic waste supplied in the cylinder is fermented by making use of aerobic bacteria, and is taken out as granular solid matter containing a small portion of moisture. The resulting granular matter is easy to handle and convenient to transport and can be effectively utilized as manure for cultivation and gardening.

Various embodiments of the invention are shown, by way of example, in the accompanying drawings, in which:

Fig. 1 is a view partly in vertical section showing the principal part of an apparatus in which a rotary cylinder encases a fixed air pipe having air discharge pipes;

Fig. 2 is a sectional view on the line II—II in Fig. 1 perpendicular to the axis of the cylinder;

Fig. 3 is a view partly in section showing the principal part of a modified apparatus in which a cylinder encases an air pipe having flat air discharge elements.

Fig. 4 is a sectional view on the line IV—IV in Fig. 3 perpendicular to the axis of the cylinder;

Fig. 5 is a view partly in vertical section showing the principal part of another modified apparatus in which an outer cylinder houses a coaxial inner cylinder having air jetting holes;

Fig. 6 is a sectional view on the line VI—VI in Fig. 5 perpendicular to the axis of the coaxial cylinders;

Fig. 7 is a view, partly in vertical section, showing an apparatus in which an air pipe has air discharge elements equipped with a shutter, the lower wall of the air pipe being formed with air holes;

Fig. 8 is a sectional view of the cylinder and the air pipe of the apparatus shown in Fig. 7; and

Fig. 9 is a schematic view similar to Fig. 8.

Throughout all the figures like parts are indicated by like reference numerals, and since they are similar in structure as well as in function descriptions relating to some such parts are omitted in connection with Figs. 3 to 9.

The present invention contemplates feeding semi-fluid and organic wastes of poor permeability as animal excrements and sea food wastes into a cylinder not to the full but up to 70 to 80 percent of the cylindier capacity so that a clearance of 30 to 20 percent of the cylinder capacity exists above the damp waste matter fed into the cylinder and receives air blown in through a fixed air pipe. By making the organic waste matter fed into the apparatus contain aerobic bacteria, the fermentation by bacteria is induced, and the organic matter is decomposed by the action of enzymes. A heating action occurs, which gradually drives away moisture, thus serving for drying and solidification of the matter being treated. Thus, the fermentation of the organic waste in the cylinder causes no substantial odour nuisance, and the gradual solidification by the heating action is effective to produce granular matter containing a very small portion of moisture.

In the apparatus embodying the principle of the invention, air may be supplied into a clearance in the cylinder by means of air discharge pipes connected to the central air pipe located coaxially with the rotatable cylinder or by flat air discharge elements fitted to the air pipe, or by air discharge holes provided in the wall of an inner cylinder. The air discharge pipes and the flat elements blow air off in the axial direction or in inclined directions.

Example 1.

The apparatus shown in Figs. 1 and 2. A cylinder 1 is supported so as to be rotatable around the axis of an inclined air pipe 2, which is supported upon support columns 3 and 4. The air pipe 2 is connected at one end with an air inlet conduit 6 for continuous supply of air in the direction of the arrow 7 during the operation of the apparatus. Air discharge pipes 5 project upwardly parallel to one another from the air pipe 2. The axis of each air discharge pipe 5 is perpendicular to that of the air pipe 2. Air is passed into

the cylinder 1 through holes 8 provided at the top ends of the pipes 5. The air pipe 2 is equipped with a disc 9 near one end thereof and with another disc 10 near the other end. The discs 9 and 10 are fixed to the air pipe 2 and loosely housed in the rotary cylinder 1 and act to close the end openings 11 and 12 of the cylinder 1. The disc 9, which is arranged at a higher level than the disc 10 as shown, carries a hopper 13 and an exhaust pipe 14. The disc 10 is also fitted with an exhaust pipe 15 near the top. The cylinder 1 is loosely mounted at its ends in bearings 18 and 19 installed in pedestals 16 and 17. Gears 20 and 21 are fitted on the surface of the cylinder 1 and engage driving bears 22 and 23, which are rotated by a prime mover 24 by way of transmission gears 25 and 26 and a shaft 27 on which the gear 26 is mounted, thereby rotating the cylinder 1. The rotational speed is preferably 5 or 8 revolutions per hour. A plurality of material-lifting crosspieces 28 is firmly attached to the inner wall of the cylinder 1 parallel to the cylinder axis. The cylinder 1 is provided near the bottom with an outlet 30 having an access cover 29.

A slight amount of aerobic bacteria is added to waste matter 31, such as animal excrements (containing a little urine) and sea food wastes before the waste matter 31 is fed into the apparatus. The bacteria-added waste matter 31 is first fed into the hopper 13 and then proceeds into the rotating cylinder 1. Due to the rotation of the cylinder 1, the waste matter 31 advances spirally, being lifted on one side and stirred by the lifting crosspieces 28 and lowered on the other side. In order to prevent the waste 31 being deposited on the periphery of the air pipe 2 and to effect sufficient rotary agitation and contact with air, the air pipe 2 should be designed to have a predetermined specified diameter. This is an outstanding feature of the invention, and therefore will be described in more detail hereinafter. If the air pipe 2 has a diameter "d" and the cylinder 1 has a diameter "D", it is desirable in view of operational efficiency, that the air pipe diameter shall be expressed as

$$d = D - \frac{2A}{D},$$

where "A" stands for the cross-sectional area of the clearance 32 in the cylinder 1. However, the larger the air pipe diameter "d", the less the supply rate of the waste to be treated. Therefore, from an economical viewpoint, it is preferable to employ the formula

$$d = \frac{2}{3}\left(D - \frac{2A}{D}\right).$$

Of course, this may vary somewhat according to the viscosity and moisture content of the waste matter to be treated. As the moisture content of the waste matter increases in excess of 65 percent, the viscosity also increases. However, when 75 percent is exceeded, the waste becomes so fluid that the viscosity decreases. The waste matter has substantially no air permeability. Hence, the fermentation treatment is not easy. By previously installing a central tubular or cylindrical body having the size of a waste core which might otherwise be formed in the centre of the cylinder, the waste matter fed between the inside wall of the cylinder and the tubular body is revolved along with the cylinder by the rotating force given by the cylinder wall and the lifting-cross pieces and raised up to the vertical centre line. After passing the limiting line the waste matter collapses in blocks, so that the total surface area becomes markedly larger. The blocks of waste matter accumulate after falling down. While collapsing, the waste comes into contact with the air forced into the clearance 32, thus making rapid progress in fermentation. The fermentation is accompanied by heat generation, which helps the evaporation of the moisture contained in the waste under treatment, thereby drying the waste. The air pipe 2 serves as the above mentioned tubular body corresponding to the core. The holes 8 of the air discharge pipes 5 are bored in the axial direction of the pipe 2. Therefore, air 7 coming out of the holes 8 proceeds substantially perpendicularly or obliquely with regard to the collapsing waste blocks. The resultant large air contact area is effective to promote fermentation and hasten drying.

When the waste material to be treated is fed into the cylinder up to about 70 per cent of the cylinder capacity, leaving about 30 percent clearance 32 of the cylinder capacity the cylinder is turned slowly counterclockwise as indicated by an arrow in Fig. 2 and the waste material is raised by means of the lifting crosspieces 28. The lifted waste material falls down immediately after passing the vertical centre line. If the moisture content is above 50%, the waste material does not fall with ease. However, after passing the vertical centre line, the material breaks off and falls down. The waste is broken into lumps while falling down and thereafter accumulates. In this process, the waste material is much exposed to the air in the clearance 32, thus advancing in fermentation.

Assuming that a cylinder is rotating without a central air pipe, as the rotation continues, the waste material is broken and, on contact with air, proceeds to ferment. At the same time, however, a core of waste material is formed in the centre of the cylinder. The core grows until the core diameter reaches a certain value. The core then becomes so

hard that air cannot penetrate into it and therefore it cannot undergo fermentation. The reason for the core formation is as stated below. Although the waste material near the inner wall of the cylinder rotates together with the cylinder by the action of the crosspieces and the cylinder wall, the rotational force of the waste material near the centre is much smaller, and the waste material in the centre remains motionless. This is because the tendency of the waste material to retain the same position by gravity and the resisting force of the waste by viscosity together result in a force, which in the cylinder centre exceeds the rotating force received from the rotating cylinder wall and the crosspieces. At the rotation of the cylinder proceeds, the waste material near the cylinder wall comes into contact with air and undergoes fermentation and therefore becomes less viscous and less capable of transmitting the revolving force of the cylinder to the waste material in the centre, thus urging the formation of the columnar core. The core formation can be prevented by previously providing a central tubular body corresponding in size to the core, and the diameter of the tubular body can be expresed as

$$d=D-\frac{2A}{D},$$

as disclosed already. Hence, the air pipe is designed in accordance with this formula.

Since the air pipe has such a diameter, the waste material 31 to which aerobic bacteria has been added is agitated without accumulation on the surface of the air pipe 2 and fermentation in the cylinder, while the waste material rotates with the aid of the crosspieces 28 fitted to the inner wall of the cylinder, as illustrated in Fig. 2. The cylinder is not entirely full of the waste material rotating along with the cylinder, so that there is always the clearance 32 in the upper portion of the interior of the cylinder. In the clearance 32, the waste material 31 is exposed to the fresh air discharged from the air discharge pipes 5 connected to the air pipe 2, whereby the growth and action of bacteria are increased, resulting in accelerated fermentation. The stirred waste material moves in the direction of rotation passing between the air discharge pipes 5 without stagnation. For smooth movement of the waste material, it is effective to tilt the air discharge pipes 5 with respect to the vertical plane taken along the cylinder axis in such a way that the top ends of the pipes 5 are advanced with respect to the said plane in the rotational direction of the cylinder, as seen in Fig. 2. It is also effective to direct the pipe holes 8 parallel to the cylinder axis as described hereinbefore. The fermentation of the waste material gives rise to heating to 60 to 70° C. Therefore, the waste material under treatment is fermented to a satisfactory extent in about 3 days and gradually solidified by moisture ejection. The bad smell is eliminated almost completely by the action of aerobic bacteria, and the exhaust air is discharged through the exhaust pipes 14 and 15. As the waste material to be treated is supplied in succession, the waste material thus solidified is forced gradually toward the outlet 30 and eventually taken out of the cylinder at the outlet 30. Preheating the air to be forced into the air conduit 6 is also effective for urging the heat evolution by fermentation, and is especially preferable in the cold season.

The waste material thus subjected to the decomposing treatment is almost odourless. Besides, the heat generation above 60° C is sufficient to kill parasites. When fowl droppings are treated, the product has a nitrogen content of 3.2 to 3.8 percent, a phosphorus content of 3.8 to 4.2 percent, and a potassium content of 2.1 to 2.3 percent, being solidified by moisture evaporation. The resulting solid matter is broken into particles of suitable size, for example about 3 millimeters in diameter. The particles are filtered or otherwise treated to serve as quick-acting organic manure.

Example 2.

The apparatus shown in Figs. 3 and 4.

This apparatus is similar to that of the preceding example except that a design modification is made in the air discharge means connected to the air pipe 2. That is, the air discharge pipes 5 in the foregoing example are replaced by flat air discharge elements 40, each of which has a triangular body with a passage 42 and sides 45 and 46. The sides 45 and 46 are connected at the top and extend tangentially with regard to the periphery of the air pipe 2. At the bottom of the triangular body, a slit 41 made in the wall of the air pipe 2 opens into the passage 42. The flat air discharge element 40 is provided with one or two air jet holes near the top. In this example, two air jet holes 43 and 44 are made in both flat walls of the triangular body, both holes being directed parallel to the cylinder axis. Since the sides 45 and 46 are narrow, the sticky waste material cannot accumulate on the flat air discharge elements 40, sliding off and collapsing successively without stagnation. Thus, the waste material can undergo desired agitation and continue smooth spiral movement. It is preferable for the flat air discharge elements 40 to be tilted with respect to the vertical plane taken along the cylinder axis, as shown in Fig. 4.

The other components of the apparatus are identical in construction and function like those employed in the preceding example.

Example 3.

The apparatus shown in Figs. 5 and 6.

In this apparatus, the cylinder used in the foregoing two embodiments houses another cylinder having a wall provided with air holes for feeding air all over the surface of the waste material under treatment. Here follows a description with reference to Figs. 5 and 6.

The cylinder 1 rotates around the axis of the air pipe 2, which is horizontal or may be inclined as in the preceding examples. As described above, the discs 9 and 10, which are large in diameter, are coaxially fixed to the air pipe 2 near both ends of the pipe. Discs 52 and 53, which are somewhat smaller than the discs 9 and 10, are also fastened to the air pipe 2 inside and near the discs 9 and 10. Just as the discs 9 and 10 are housed loosely in the rotary cylinder 1, the discs 52 and 53 are loosely encased in an inner cylinder 50 having a multiplicity of air holes 51, so that the openings 11 and 12 at the ends of the cylinder 1 are closed by the discs 9 and 10 while both end openings 54 and 55 in the inner cylinder 50 are closed by the discs 52 and 53. A hollow space 56 is provided between the cylinder 1 and the inner cylinder 50. Both cylinders 1 and 50 are firmly connected together by means of a plurality of support members 57 arranged between the cylinders. Thus, the inner cylinder 50 rotates together with the cylinder 1. The air pipe 2 is provided with air jet holes 61 and 62, the hole 61 being between the disc 9 and the disc 52 and the hole 62 between the discs 10 and 53. The air flowing in the direction of the arrow 7 in the air pipe 2 flows through the air jet holes 61 and 62 and flows into the hollow space 56 and then flows into the inner cylinder 50 through the air holes 51 formed in the wall of the inner cylinder. The disc 52 is connected with a hopper 13 opening into the inner cylinder and with an exhaust pipe 59. The other disc 53 is also provided with an exhaust pipe 60. The cylinder 1 is revolved by means of the prime mover 24 24, as in the preceding examples, being accompanied by the rotation of the inner cylinder 50. A plurality of lifting crosspieces 58 is firmly fitted to the inside wall of the inner cylinder 50 parallel to the cylinder axis.

As in the preceding examples, aerobic bacteria is added to the organic material 31 to be treated. The material 31 is thereafter fed into the hopper 13 and proceeds into the rotating inner cylinder 50. As the inner cylinder 50 continues to rotate, the waste material 31 gradually advances toward the outlet end, while being stirred by the lifting crosspieces 58 and fermented by the action of the added aerobic bacteria. Since the waste material is fed into the inner cylinder up to about 70 to 80% of the capacity thereof, the clearance 32 is formed which is supplied with much air through the air pipe 2, the air jet holes 61 and 62, the space 56 and the air holes 51 formed in the wall of the inner cylinder 50. The air blown off into the clearance 32 comes into contact with the surface 36 of the material 31. Meanwhile, being turned and agitated, the material 31 collapses into blocks as in the preceding examples. Therefore, almost all the surfaces of the material are exposed to air. Hence the growth of bacteria is increased, with consequent promotion of fermentation. The waste material thus treated is solidified and taken out of the inner cylinder at the outlet 30 provided near the bottom of the cylinder.

Example 4.

The apparatus shown in Fig. 7, 8 and 9.

This apparatus is similar to the apparatus shown in Figs. 3 and 4 except that the air pipe is provided internally with a shutter for opening and closing the slits 41 in the air discharge elements 40 and that the lower wall of the air pipe is provided with air holes which pass air for drying the material.

The construction and tilting of the cylinder 1, the supply of air 7 into the air pipe 2, and so on are the same as in Example 2 (referred to above) and therefore need not be explained here.

A skewer rod 71 is furnished with arcuate shutter plates 70 for opening and closing, from inside, slits 41 provided in the air discharge elements 40 of the air pipe 2. The skewer rod 71 is supported so as to be able to slide by means of holders 72 and 73 fixed near the ends of the air pipe 2. A handle 74 is provided to operate the skewer rod for opening and closing the slits 41. Furthermore, air holes 75 are formed in the lower portion of the wall of the air pipe 2. The lines of air holes 75 are arranged in a regular or zigzag pattern. As shown in Fig. 7, cover plates 76 having openings 77 are provided to cover the air holes 75.

As has been described in the foregoing examples, the waste material 31, solidified and formed into blocks in the cylinder 1, successively collapses downward below the air pipe 2, as seen in Fig. 9, and deposits on the inner wall of the cylinder 1 by gravity and the rotation of the cylinder. Thus, it is so designed that the deposit is formed apart from the lower wall surface of the air pipe so that the clearance 32 extends between the air holes 75 and the surface 36 of the material 31. Said air holes 75 discharge air when the skewer rod 71 is shifted in such a way that the shutter plates 70 fixed to the skewer rod 71 close the slits 41 in the air discharge elements 40. At the initial stage of material treatment, the air pipe is entirely surrounded by the material so that the air supplied through the air holes 75 is small in amount.

However, as the treatment proceeds, the material falls down and allows the clearance to extend in the lower zone as shown in Fig. 9. Therefore, the air air issues out of the air holes 75 and dries the material, thus promoting solidification and block formation. Since the air holes 75 are provided with the cover plates 76 having the rear openings 77 to prevent the material closing the air holes 75 and to direct the air axially or slantwise, the air stream dries the surface 36 of the material having fallen down successively.

As will be apparent from the foregoing description of the embodiments, the apparatus of the present invention causes substantially no odour nuisance since such semifluid organic materials as animal excrements and sea food wastes are treated by fermentation in a cylinder which is almost closed up. Therefore, flies do not swarm during the treating operation. Besides, the treatment of the waste material produces solidified matter easy to handle and is therefore economical in actual practice. Furthermore, it is to be noted again that the axial air pipe is designed to have a specific diameter suitable for preventing semifluid excreta and fish wastes from firmly adhering like clay to the circumferential wall of the air pipe.

WHAT WE CLAIM IS:—

1. An apparatus for disposal of organic materials such as excrements of birds and beasts and sea food wastes, comprising an outer cylinder, a fixed air supply pipe in the cylinder having a predetermined specified diameter to prevent rotating semi-fluid material from hardening in the form of a core in the centre of the cylinder, air discharge means fitted to the air supply pipe and projecting radially thereof, a disc provided near each end of the air supply pipe perpendicularly to the axis of the air supply pipe, the said cylinder being rotatable about the axis of the air supply pipe and housing the discs, a hopper for supplying the organic materials to the interior of the cylinder, and exhaust pipes fitted to the discs, air being fed into the air supply pipe and cylinder and discharged through the exhaust pipes.

2. Apparatus as claimed in Claim 1, wherein the diameter of the air supply pipe is expressed as

$$d=\frac{2}{3}\left(D-\frac{2A}{D}\right)$$

wherein A is the cross sectional area of the clearance in the cylinder above the waste matter; d is the diameter of the air supply pipe and D is the diameter of the cylinder.

3. An apparatus as claimed in claim 1 or 2, wherein the air supply pipe is equipped with triangular flat air discharge means which are directed perpendicularly to the axis of the air supply pipe and have sides extending outwardly with respect to the periphery of the air supply pipe, the air discharge means being provided with air jet holes directed parallel to the axis of the air supply pipe.

4. An apparatus as claimed in claim 1, comprising other discs provided on the air supply pipe internally of the first-mentioned discs, an outer cylinder housing the first-mentioned discs, and an inner cylinder housing the said other discs and having a plurality of material-agitating crosspieces in parallel with the axis of the air supply pipe, and a plurality of air holes formed in the wall of the inner cylinder, the two spaced cylinders defining an annular hollow space between them and being rotatable around the axis of the fixed air supply pipe, a hopper fitted to the two discs at one end of the apparatus and opening into the inner cylinder, and exhaust pipes fitted to the inner discs, air being supplied into the inner cylinder through the air supply pipe, air discharge holes in the pipe, the said hollow space and the air holes formed in the wall of the inner cylinder, the air being discharged through the exhaust pipes.

5. Apparatus as claimed in any of the preceding claims, wherein the lower wall of the air supply pipe is provided with air discharge holes provided with shutters.

6. Apparatus for disposing of excrements, substantially as described with reference to Figures 1 and 2, or Figure 4 or Figures 5 and 6, or Figures 7 and 8 or Figure 9 of the accompanying drawings.

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1317061 COMPLETE SPECIFICATION

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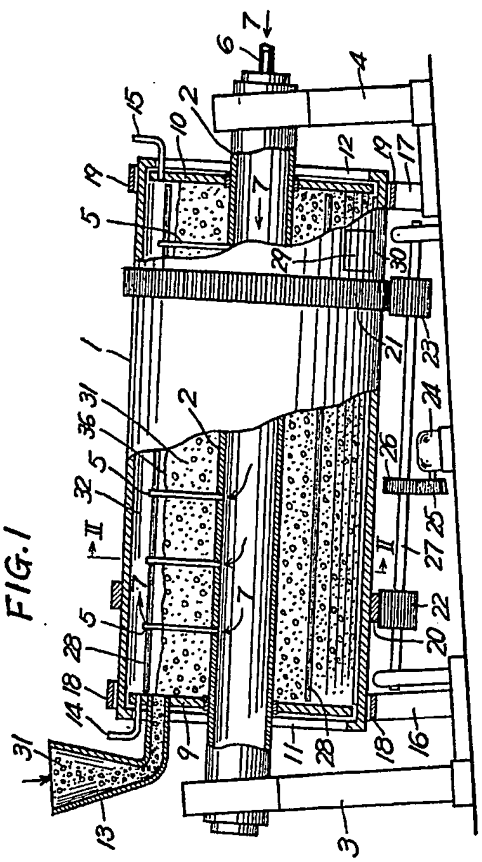

FIG. 1

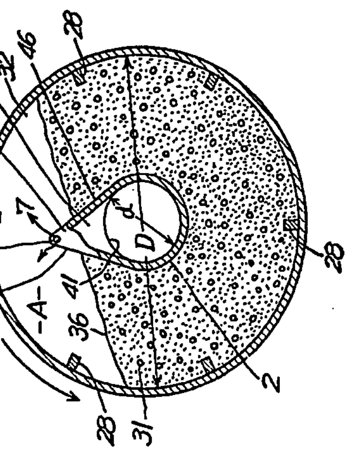
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FIG.4

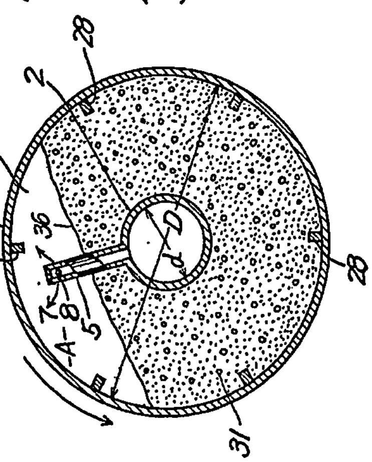
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FIG.2

1317061 COMPLETE SPECIFICATION

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Sheet 3

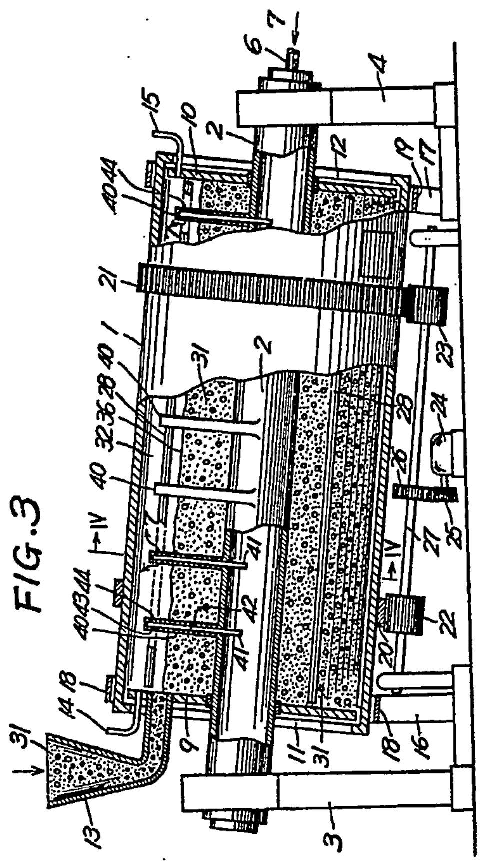

FIG.3

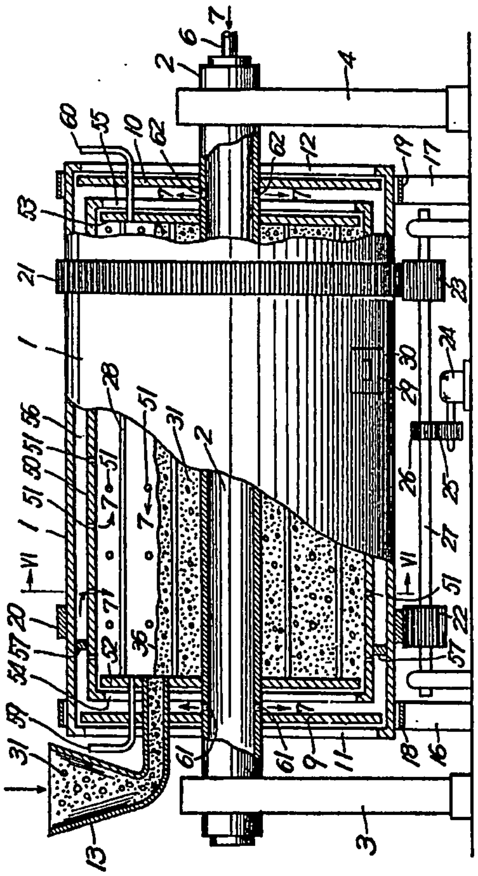

FIG.5

1317061 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 5

FIG. 7

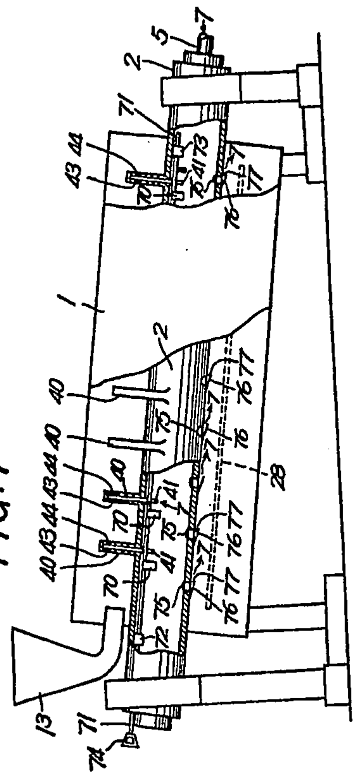

FIG. 6

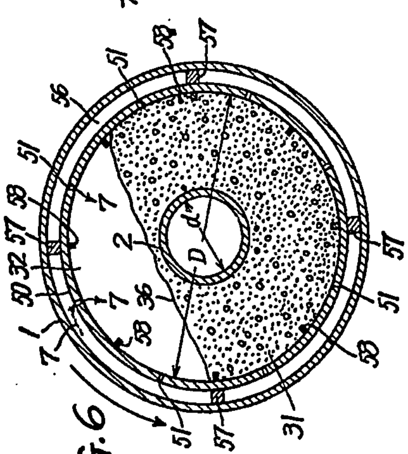

FIG.9

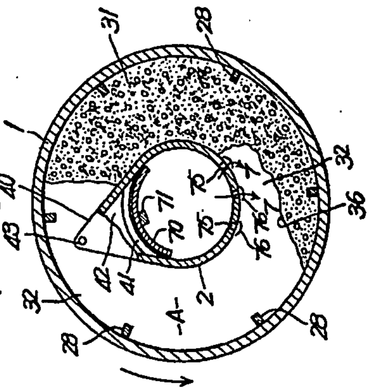

FIG.8